the vertical distance of the dove from A. This may be represented by $c\theta$. It follows that $BP=\sqrt{a^2\theta^2+c^2\theta^2}=(a^2+c^2)^{\frac{1}{2}}\theta$.

The co-ordinates of P are:

$x=a\cos\theta+(a^2+c^2)^{\frac{1}{2}}\theta\sin\theta$,

$y=a\sin\theta-(a^2+c^2)^{\frac{1}{2}}\theta\cos\theta$,

$z=c\theta$, the axis of z coinciding with the cylinder's axis. $\therefore ds^2=dx^2+dy^2+dz^2=\left[2a^2+2c^2-2a(a^2+c^2)^{\frac{1}{2}}+(a^2+c^2)\theta^2\right]d\theta^2$.

$$\therefore s=\int\left[2a^2+2c^2-2a(a^2+c^2)^{\frac{1}{2}}+(a^2+c^2)\theta^2\right]^{\frac{1}{2}}d\theta=\sqrt{a^2+c^2}\left\{\frac{\theta}{2}\left(\frac{2a^2+2c^2-2a(a^2+c^2)^{\frac{1}{2}}}{a^2+c^2}+\theta^2\right)^{\frac{1}{2}}+\frac{a^2+c^2-a\sqrt{a^2+c^2}}{a^2+c^2}\log\left[\theta+\left(\frac{2a^2+2c^2-2a\sqrt{a^2+c^2}}{a^2+c^2}+\theta^2\right)^{\frac{1}{2}}\right]\right\}.$$

$a=1$, $c=\frac{1}{2\pi}$, and the θ-limits are 40π and 0.

$\therefore s=7995$ feet, approximately.

[*C. E. Myers* solves for case I. and gets 7895.517768 feet. *Prof. Zerr* solves by a different method and gets 8023.754 feet and 8124.910+feet, for his results.]

PROBLEMS.

12. Proposed by ISAAC L. BEVERAGE, Monterey, Virginia.

Given the equations $2z^3=x+3z$ and $5z^2=y+2z$. To find $\frac{dy}{dx}$ for $x=o$.

13. Proposed by J. A. CALDERHEAD, B. Sc., Superintendent of Schools, Limaville, Ohio.

A steamer whose course is due west and speed 10 knots is sighted by another steamer going at 8 knots; what course must the latter steer, so as to cross the track of the former at the least possible distance from her?

14. Proposed by J. F. W. SCHEFFER, A. M., Hagerstown, Maryland.

Right triangles are inscribed in a circle whose centre $=(a,b)$, and radius$=c$. If one of the legs passes through a fixed point, prove that $c^2(x^2+y^2)=(a^2+b^2-c^2-ax-by)^2$ is the curve to which the other leg is always tangent; the fixed point being the origin of the co-ordinates.

15. Proposed by CHARLES E. MYERS, Canton, Ohio.

From a given quantity of material a cylindrical cup with circular bottom and open top is to be made, the cup to contain the greatest amount. What must be its dimensions?

Solutions to these problems should be received on or before May 1st.